



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 14, 2026 – 01:10 PM UTC

PDB ID : 6H0B / pdb_00006h0b
Title : Crystal structure of the human GalNAc-T4 in complex with UDP, manganese and the diglycopeptide 6.
Authors : de las Rivas, M.; Daniel, E.J.P.; Coelho, H.; Lira-Navarrete, E.; Raich, L.; Companon, I.; Diniz, A.; Lagartera, L.; Jimenez-Barbero, J.; Clausen, H.; Rovira, C.; Marcelo, F.; Corzana, F.; Gerken, T.A.; Hurtado-Guerrero, R.
Deposited on : 2018-07-08
Resolution : 1.80 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references](#) ①) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

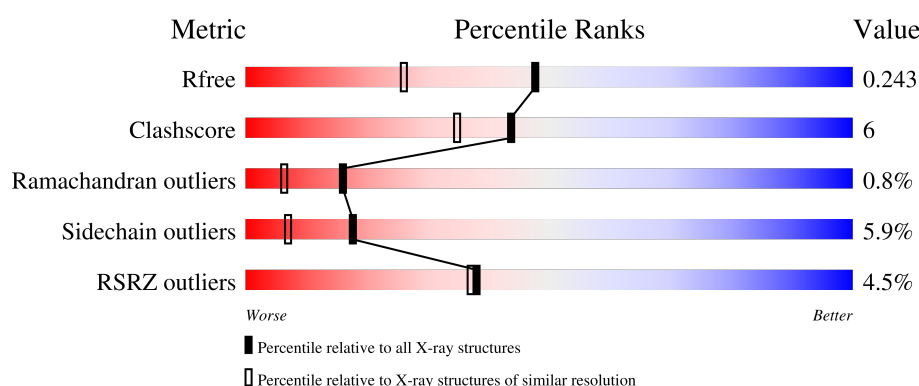
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	7662 (1.80-1.80)
Clashscore	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)
RSRZ outliers	180081	7663 (1.80-1.80)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	578	6% 75% 12% • 11%
1	B	578	2% 78% 10% •• 10%
2	F	16	6% 88% 6% 6%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
7	NGA	F	101	X	-	-	-
7	NGA	F	102	X	-	-	-

2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 9606 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

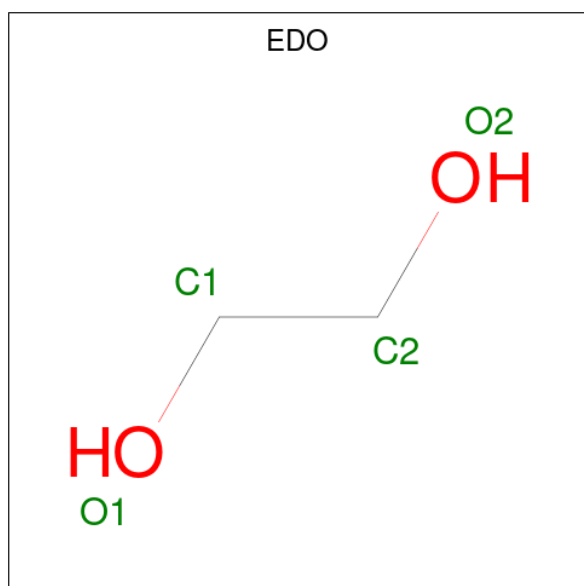
- Molecule 1 is a protein called Polypeptide N-acetylgalactosaminyltransferase 4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	515	Total	C	N	O	S	0	8	0
			4249	2696	751	779	23			
1	B	521	Total	C	N	O	S	0	6	0
			4285	2719	758	786	22			

- Molecule 2 is a protein called ALA-THR-GLY-ALA-GLY-ALA-GLY-ALA-GLY-THR-THR-PRO-GLY-PRO-GLY.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	F	15	Total	C	N	O	0	0	0
			79	46	15	18			

- Molecule 3 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			4	2	2		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	B	1	Total 4	C 2	O 2	0	0
3	B	1	Total 4	C 2	O 2	0	0
3	B	1	Total 4	C 2	O 2	0	0
3	B	1	Total 4	C 2	O 2	0	0

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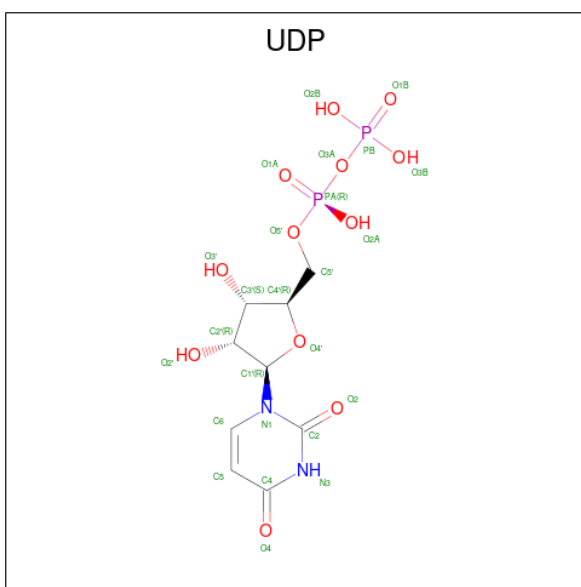
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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0

- Molecule 4 is MANGANESE (II) ION (CCD ID: MN) (formula: Mn).

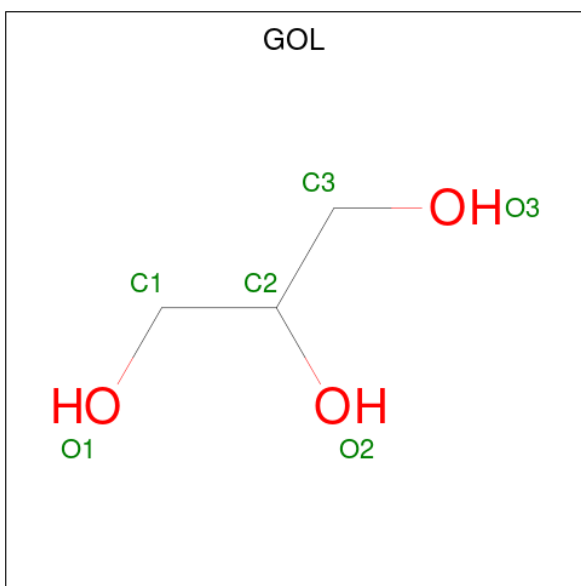
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	1	Total Mn 1 1	0	0

- Molecule 5 is URIDINE-5'-DIPHOSPHATE (CCD ID: UDP) (formula: C₉H₁₄N₂O₁₂P₂).



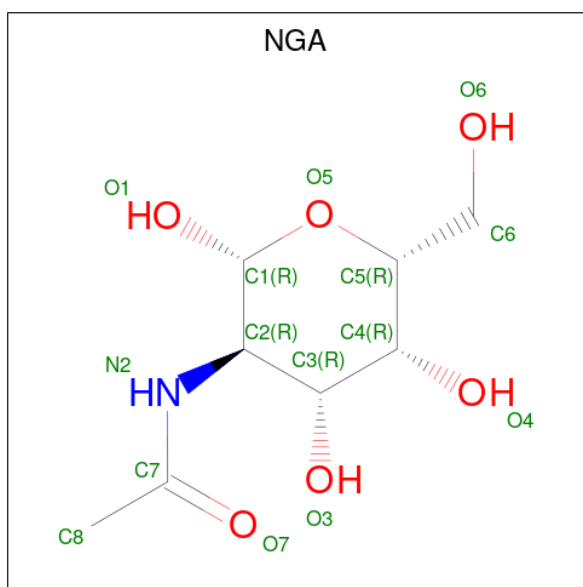
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	B	1	Total	C	N	O	P	0	0
			25	9	2	12	2		

- Molecule 6 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	B	1	Total	C	O	0	0
			6	3	3		

- Molecule 7 is 2-acetamido-2-deoxy-beta-D-galactopyranose (CCD ID: NGA) (formula: $C_8H_{15}NO_6$).

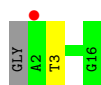


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	F	1	Total	C	N	O	0	0
			14	8	1	5		
7	F	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	396	Total	O	0	0
			396	396		
8	B	378	Total	O	0	0
			378	378		
8	F	15	Total	O	0	0
			15	15		

Chain F: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	66.09Å 81.33Å 84.86Å 65.55° 68.66° 74.31°	Depositor
Resolution (Å)	73.99 – 1.80 73.99 – 1.80	Depositor EDS
% Data completeness (in resolution range)	97.3 (73.99-1.80) 97.3 (73.99-1.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.32 (at 1.80Å)	Xtriage
Refinement program	REFMAC 5.8.0135	Depositor
R, R_{free}	0.190 , 0.238 0.199 , 0.243	Depositor DCC
R_{free} test set	3699 reflections (2.69%)	wwPDB-VP
Wilson B-factor (Å ²)	30.7	Xtriage
Anisotropy	0.867	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 44.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	9606	wwPDB-VP
Average B, all atoms (Å ²)	54.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.97% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: NGA, MN, EDO, UDP, GOL

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.92	1/4383 (0.0%)	1.03	6/5934 (0.1%)
1	B	0.98	3/4417 (0.1%)	1.04	13/5984 (0.2%)
2	F	1.20	0/80	1.06	0/109
All	All	0.95	4/8880 (0.0%)	1.03	19/12027 (0.2%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
1	B	0	1
All	All	0	2

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	350	GLY	N-CA	-6.92	1.35	1.45
1	B	211	ARG	CZ-NH2	6.81	1.42	1.33
1	A	350	GLY	N-CA	-5.30	1.37	1.45
1	B	344	ARG	CD-NE	-5.24	1.39	1.46

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	349	GLY	N-CA-C	12.45	142.68	113.18
1	A	331	MET	N-CA-C	12.13	125.89	111.82
1	A	349	GLY	N-CA-C	11.45	131.22	115.30
1	A	344	ARG	NE-CZ-NH2	-7.28	112.65	119.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	344	ARG	NE-CZ-NH2	-7.10	112.81	119.20
1	A	349	GLY	O-C-N	-6.43	114.37	122.41
1	B	309	MET	CB-CA-C	-6.27	98.94	109.48
1	B	348	CYS	CA-C-N	6.06	133.29	121.41
1	B	348	CYS	C-N-CA	6.06	133.29	121.41
1	B	209	ARG	CG-CD-NE	-5.91	98.99	112.00
1	B	204	ARG	CG-CD-NE	-5.78	99.28	112.00
1	B	301	ILE	N-CA-C	5.65	117.60	112.29
1	A	344	ARG	NE-CZ-NH1	5.60	127.10	121.50
1	A	204	ARG	CG-CD-NE	-5.46	100.00	112.00
1	B	209	ARG	NE-CZ-NH2	-5.25	114.48	119.20
1	B	344	ARG	NE-CZ-NH1	5.15	126.65	121.50
1	B	332	GLU	CA-C-N	5.14	131.23	121.97
1	B	332	GLU	C-N-CA	5.14	131.23	121.97
1	B	349	GLY	O-C-N	-5.11	116.06	122.70

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	349	GLY	Peptide
1	B	349	GLY	Peptide

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4249	0	4144	55	0
1	B	4285	0	4173	46	0
2	F	79	0	70	0	0
3	A	72	0	108	8	0
3	B	72	0	108	3	0
4	B	1	0	0	0	0
5	B	25	0	11	0	0
6	B	6	0	8	0	0
7	F	28	0	26	1	0
8	A	396	0	0	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
8	B	378	0	0	8	0
8	F	15	0	0	0	0
All	All	9606	0	8648	106	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 6.

All (106) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:309:MET:HE2	1:B:311:GLY:HA2	1.50	0.93
1:A:466:ASN:O	1:A:466:ASN:ND2	2.08	0.86
1:B:465:ASN:H	1:B:465:ASN:HD22	1.23	0.85
1:B:309:MET:HE2	1:B:311:GLY:CA	2.09	0.82
1:A:345:VAL:O	1:A:350:GLY:HA3	1.78	0.82
1:B:345:VAL:O	1:B:350:GLY:HA3	1.80	0.81
1:A:511:ASN:ND2	1:A:561:GLN:HG2	1.96	0.81
1:A:257:ASP:OD1	1:A:269:GLN:HG2	1.83	0.78
1:A:511:ASN:ND2	1:A:561:GLN:CG	2.47	0.78
1:A:536:ASP:O	1:A:573:ILE:HG23	1.86	0.76
1:A:571:ASN:H	1:A:571:ASN:HD22	1.34	0.74
1:A:355:HIS:HD2	1:A:357:CYS:H	1.38	0.71
1:A:550:ALA:O	1:A:571:ASN:HB3	1.90	0.70
1:B:309:MET:HE1	1:B:314:PHE:CD1	2.27	0.70
1:B:355:HIS:HD2	1:B:357:CYS:H	1.41	0.69
1:A:511:ASN:HD21	1:A:561:GLN:CD	2.00	0.68
1:A:550:ALA:HB3	1:A:571:ASN:HB3	1.76	0.67
1:A:571:ASN:H	1:A:571:ASN:ND2	1.92	0.67
1:B:489:THR:HG21	1:B:493:GLU:OE1	1.95	0.66
1:A:511:ASN:HD22	1:A:561:GLN:HG2	1.60	0.66
1:A:489:THR:HG21	1:A:493:GLU:OE1	1.96	0.66
1:B:216[A]:THR:HG21	8:B:1044:HOH:O	1.96	0.65
1:B:209:ARG:HH22	1:B:332:GLU:CD	2.04	0.65
1:A:537:GLY:HA3	1:A:573:ILE:HG23	1.80	0.64
1:B:553:THR:OG1	1:B:557:ARG:HG3	1.99	0.63
1:B:309:MET:CE	1:B:314:PHE:CD1	2.82	0.63
3:A:608:EDO:H22	3:A:618:EDO:H21	1.80	0.62
1:A:233:ASN:ND2	1:A:268:MET:HE1	2.16	0.61
1:A:550:ALA:O	1:A:571:ASN:CB	2.49	0.61
1:B:509:GLN:HA	1:B:509:GLN:OE1	2.00	0.60
1:B:381:ARG:NH2	1:B:408:ASP:O	2.34	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:462:SER:HB3	1:A:463:PRO:CD	2.32	0.60
1:A:511:ASN:HD21	1:A:561:GLN:NE2	2.01	0.59
1:B:309:MET:CE	1:B:311:GLY:HA2	2.28	0.59
1:B:309:MET:HG3	1:B:352:LEU:HD11	1.84	0.59
1:A:230[A]:CYS:HB2	1:A:361:GLY:O	2.02	0.58
1:A:326:THR:O	1:A:344:ARG:NH2	2.32	0.58
1:B:84:GLN:NE2	8:B:703:HOH:O	2.35	0.58
1:B:489:THR:HG21	3:B:620:EDO:H12	1.86	0.58
1:A:511:ASN:ND2	1:A:561:GLN:CD	2.62	0.58
1:A:286:TRP:CH2	1:A:310:ALA:HB1	2.39	0.57
1:B:489:THR:CG2	3:B:620:EDO:H12	2.34	0.57
1:B:465:ASN:HD22	1:B:465:ASN:N	1.98	0.57
1:B:257:ASP:OD2	1:B:359:HIS:HD2	1.88	0.56
1:A:227:ASP:OD1	1:A:230[B]:CYS:SG	2.64	0.56
1:A:257:ASP:OD2	1:A:359:HIS:HD2	1.90	0.55
1:B:197:ARG:NH1	8:B:706:HOH:O	2.40	0.55
1:B:349:GLY:HA2	8:B:747:HOH:O	2.05	0.55
1:B:209:ARG:NH2	1:B:332:GLU:OE2	2.39	0.54
1:A:511:ASN:HD21	1:A:561:GLN:CG	2.21	0.53
1:A:119:LYS:HB3	1:A:270:ILE:HD11	1.90	0.52
1:A:286:TRP:CZ3	1:A:310:ALA:HB1	2.45	0.51
1:A:233:ASN:ND2	8:A:708:HOH:O	2.43	0.51
1:A:213:ILE:O	1:A:216[A]:THR:HG22	2.11	0.50
1:B:439:GLU:OE2	3:B:620:EDO:H21	2.12	0.50
1:B:233:ASN:ND2	1:B:268:MET:HE1	2.26	0.50
3:A:608:EDO:C2	3:A:618:EDO:H21	2.40	0.50
1:A:537:GLY:HA3	1:A:573:ILE:CG2	2.43	0.49
1:B:319:LYS:HE2	8:B:1017:HOH:O	2.12	0.49
1:A:313:LEU:HD13	3:A:613:EDO:O1	2.12	0.49
1:B:465:ASN:H	1:B:465:ASN:ND2	2.02	0.48
1:A:536:ASP:O	1:A:573:ILE:HD12	2.15	0.47
1:A:550:ALA:C	1:A:571:ASN:HB3	2.39	0.47
1:A:221:ASP:HB3	3:A:607:EDO:H11	1.96	0.46
1:A:550:ALA:CB	1:A:571:ASN:HB3	2.45	0.46
1:A:566:ASP:OD1	1:A:568:LEU:HD12	2.16	0.46
1:A:174:ASP:OD2	1:A:200[B]:ARG:NE	2.48	0.46
1:A:571:ASN:ND2	1:A:571:ASN:N	2.61	0.46
1:B:84:GLN:HE21	1:B:84:GLN:HA	1.80	0.46
1:A:462:SER:CB	1:A:463:PRO:CD	2.93	0.45
1:A:537:GLY:O	1:A:573:ILE:HA	2.17	0.45
1:B:233:ASN:ND2	8:B:716:HOH:O	2.50	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:206:GLY:CA	1:B:333:VAL:HA	2.46	0.45
1:B:213:ILE:O	1:B:216[A]:THR:HG22	2.16	0.45
1:A:200[B]:ARG:HG2	1:A:201:THR:O	2.17	0.44
1:B:497:ASN:HA	1:B:500:THR:O	2.17	0.44
1:A:356:PRO:O	1:A:359:HIS:HE1	2.01	0.44
1:A:533:PHE:CZ	1:A:539:ILE:HD11	2.53	0.44
1:B:533:PHE:CZ	1:B:539:ILE:HD11	2.53	0.44
1:A:119:LYS:HB3	1:A:270:ILE:CD1	2.47	0.44
1:A:216[A]:THR:HG21	3:A:611:EDO:O1	2.17	0.44
1:B:216[A]:THR:CG2	8:B:814:HOH:O	2.66	0.44
1:A:447:ALA:HA	1:A:484:GLN:O	2.18	0.43
3:A:612:EDO:C2	8:A:949:HOH:O	2.66	0.43
1:B:328:ASP:OD1	1:B:328:ASP:C	2.60	0.43
1:B:505:GLU:HB3	1:B:529:ILE:HG22	2.01	0.43
1:A:505:GLU:HB3	1:A:529:ILE:HG22	2.00	0.43
1:B:83:LEU:HB3	1:B:85:LEU:HD13	1.99	0.43
1:A:99:ARG:HA	1:A:99:ARG:HD3	1.87	0.43
1:B:356:PRO:O	1:B:359:HIS:HE1	2.02	0.43
1:A:355:HIS:CD2	1:A:357:CYS:H	2.27	0.43
1:A:462:SER:CB	1:A:463:PRO:HD3	2.48	0.43
1:B:478:HIS:HE2	7:F:102:NGA:C3	2.31	0.42
1:B:269[A]:GLN:NE2	8:B:722:HOH:O	2.52	0.42
1:B:333:VAL:HG13	1:B:374:ASN:OD1	2.19	0.42
1:B:447:ALA:HA	1:B:484:GLN:O	2.20	0.42
1:B:232:CYS:HB3	1:B:236:TRP:CD1	2.55	0.42
1:A:497:ASN:HA	1:A:500:THR:O	2.20	0.41
1:A:232:CYS:HB3	1:A:236:TRP:CD1	2.55	0.41
1:A:391:LYS:O	1:A:394:PHE:HB3	2.19	0.41
1:B:465:ASN:N	1:B:465:ASN:ND2	2.66	0.41
1:A:550:ALA:CA	1:A:571:ASN:HB3	2.51	0.41
3:A:612:EDO:H21	8:A:949:HOH:O	2.21	0.41
1:B:326:THR:O	1:B:344:ARG:NH2	2.50	0.40
3:A:607:EDO:H12	8:A:849:HOH:O	2.22	0.40
1:B:355:HIS:CD2	1:B:357:CYS:H	2.29	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	519/578 (90%)	500 (96%)	15 (3%)	4 (1%)	16	6
1	B	525/578 (91%)	511 (97%)	10 (2%)	4 (1%)	16	6
2	F	13/16 (81%)	10 (77%)	3 (23%)	0	100	100
All	All	1057/1172 (90%)	1021 (97%)	28 (3%)	8 (1%)	16	6

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	536	ASP
1	B	333	VAL
1	B	349	GLY
1	A	350	GLY
1	A	569	ASP
1	B	326	THR
1	A	183	LYS
1	B	350	GLY

5.3.2 Protein sidechains

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	466/507 (92%)	437 (94%)	29 (6%)	16	6
1	B	468/507 (92%)	443 (95%)	25 (5%)	20	9
2	F	5/5 (100%)	4 (80%)	1 (20%)	1	0

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	939/1019 (92%)	884 (94%)	55 (6%)	18 7

All (55) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	61	ARG
1	A	72	ARG
1	A	82	LYS
1	A	90	LEU
1	A	91	LYS
1	A	99	ARG
1	A	134	LEU
1	A	183	LYS
1	A	270	ILE
1	A	332	GLU
1	A	367	ARG
1	A	374	ASN
1	A	414	LEU
1	A	434	ASN
1	A	461	ASN
1	A	464	ASP
1	A	465	ASN
1	A	466	ASN
1	A	474	LEU
1	A	489	THR
1	A	505	GLU
1	A	528	ASN
1	A	534	LYS
1	A	535	GLU
1	A	546	LEU
1	A	555	GLU
1	A	564	THR
1	A	568	LEU
1	A	571	ASN
1	B	61	ARG
1	B	72	ARG
1	B	82	LYS
1	B	84	GLN
1	B	85	LEU
1	B	90	LEU
1	B	91	LYS
1	B	134	LEU

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Mol	Chain	Res	Type
1	B	292	GLN
1	B	333	VAL
1	B	351	LYS
1	B	403	LYS
1	B	414	LEU
1	B	461	ASN
1	B	464	ASP
1	B	465	ASN
1	B	468	THR
1	B	489	THR
1	B	505	GLU
1	B	528	ASN
1	B	535	GLU
1	B	546	LEU
1	B	557	ARG
1	B	564	THR
1	B	568	LEU
2	F	3	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (25) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	93	GLN
1	A	115	HIS
1	A	229	HIS
1	A	233	ASN
1	A	262	ASN
1	A	338	ASN
1	A	355	HIS
1	A	359	HIS
1	A	362	HIS
1	A	374	ASN
1	A	511	ASN
1	A	516	GLN
1	A	517	ASN
1	A	571	ASN
1	B	84	GLN
1	B	93	GLN
1	B	229	HIS
1	B	233	ASN
1	B	262	ASN
1	B	355	HIS

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Mol	Chain	Res	Type
1	B	359	HIS
1	B	377	GLN
1	B	465	ASN
1	B	516	GLN
1	B	517	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 41 ligands modelled in this entry, 1 is monoatomic - leaving 40 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	EDO	A	617	-	3,3,3	0.28	0	2,2,2	0.29	0
3	EDO	B	613	-	3,3,3	0.55	0	2,2,2	0.22	0
3	EDO	B	612	-	3,3,3	0.65	0	2,2,2	1.42	0
3	EDO	B	616	-	3,3,3	0.33	0	2,2,2	0.56	0
6	GOL	B	621	-	5,5,5	0.37	0	5,5,5	0.57	0
3	EDO	A	607	-	3,3,3	0.42	0	2,2,2	0.17	0
3	EDO	A	614	-	3,3,3	0.40	0	2,2,2	0.43	0
3	EDO	A	605	-	3,3,3	0.34	0	2,2,2	0.49	0
7	NGA	F	102	2	14,14,15	0.51	0	17,19,21	0.99	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	EDO	B	608	-	3,3,3	0.33	0	2,2,2	0.49	0
5	UDP	B	602	4	25,26,26	1.41	4 (16%)	38,40,40	1.76	6 (15%)
3	EDO	A	612	-	3,3,3	0.42	0	2,2,2	1.40	0
3	EDO	B	606	-	3,3,3	0.57	0	2,2,2	0.26	0
3	EDO	A	611	-	3,3,3	0.72	0	2,2,2	0.07	0
3	EDO	A	616	-	3,3,3	0.47	0	2,2,2	0.47	0
3	EDO	B	620	-	3,3,3	0.28	0	2,2,2	0.88	0
3	EDO	A	602	-	3,3,3	0.31	0	2,2,2	0.72	0
3	EDO	A	609	-	3,3,3	0.55	0	2,2,2	0.26	0
3	EDO	A	618	-	3,3,3	0.43	0	2,2,2	0.38	0
7	NGA	F	101	2	14,14,15	0.89	0	17,19,21	0.97	0
3	EDO	B	610	-	3,3,3	0.41	0	2,2,2	0.53	0
3	EDO	B	604	-	3,3,3	0.33	0	2,2,2	0.58	0
3	EDO	B	603	-	3,3,3	0.75	0	2,2,2	0.30	0
3	EDO	B	617	-	3,3,3	0.63	0	2,2,2	0.17	0
3	EDO	A	608	-	3,3,3	0.51	0	2,2,2	0.11	0
3	EDO	B	609	-	3,3,3	0.34	0	2,2,2	0.65	0
3	EDO	B	615	-	3,3,3	0.44	0	2,2,2	0.47	0
3	EDO	A	606	-	3,3,3	0.44	0	2,2,2	0.27	0
3	EDO	B	619	-	3,3,3	0.49	0	2,2,2	0.29	0
3	EDO	B	611	-	3,3,3	0.39	0	2,2,2	0.58	0
3	EDO	B	618	-	3,3,3	0.49	0	2,2,2	0.35	0
3	EDO	B	607	-	3,3,3	0.49	0	2,2,2	0.41	0
3	EDO	A	613	-	3,3,3	0.42	0	2,2,2	0.53	0
3	EDO	B	605	-	3,3,3	0.58	0	2,2,2	0.26	0
3	EDO	B	614	-	3,3,3	0.46	0	2,2,2	0.65	0
3	EDO	A	610	-	3,3,3	0.44	0	2,2,2	0.66	0
3	EDO	A	615	-	3,3,3	0.48	0	2,2,2	0.46	0
3	EDO	A	604	-	3,3,3	0.54	0	2,2,2	0.55	0
3	EDO	A	603	-	3,3,3	0.41	0	2,2,2	0.64	0
3	EDO	A	601	-	3,3,3	0.40	0	2,2,2	0.94	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	EDO	A	617	-	-	1/1/1/1	-
3	EDO	B	613	-	-	0/1/1/1	-
3	EDO	B	612	-	-	1/1/1/1	-
3	EDO	B	616	-	-	1/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	GOL	B	621	-	-	1/4/4/4	-
3	EDO	A	607	-	-	1/1/1/1	-
3	EDO	A	614	-	-	1/1/1/1	-
3	EDO	A	605	-	-	0/1/1/1	-
7	NGA	F	102	2	1/1/5/7	1/6/23/26	0/1/1/1
3	EDO	B	608	-	-	0/1/1/1	-
5	UDP	B	602	4	-	0/16/32/32	0/2/2/2
3	EDO	A	612	-	-	1/1/1/1	-
3	EDO	B	606	-	-	1/1/1/1	-
3	EDO	A	611	-	-	1/1/1/1	-
3	EDO	A	616	-	-	0/1/1/1	-
3	EDO	B	620	-	-	0/1/1/1	-
3	EDO	A	602	-	-	0/1/1/1	-
3	EDO	A	609	-	-	1/1/1/1	-
3	EDO	A	618	-	-	0/1/1/1	-
7	NGA	F	101	2	1/1/5/7	0/6/23/26	0/1/1/1
3	EDO	B	610	-	-	1/1/1/1	-
3	EDO	B	604	-	-	1/1/1/1	-
3	EDO	B	603	-	-	0/1/1/1	-
3	EDO	B	617	-	-	1/1/1/1	-
3	EDO	A	608	-	-	1/1/1/1	-
3	EDO	B	609	-	-	1/1/1/1	-
3	EDO	B	615	-	-	1/1/1/1	-
3	EDO	A	606	-	-	0/1/1/1	-
3	EDO	B	619	-	-	1/1/1/1	-
3	EDO	B	611	-	-	1/1/1/1	-
3	EDO	B	618	-	-	1/1/1/1	-
3	EDO	B	607	-	-	0/1/1/1	-
3	EDO	A	613	-	-	1/1/1/1	-
3	EDO	B	605	-	-	1/1/1/1	-
3	EDO	B	614	-	-	1/1/1/1	-
3	EDO	A	610	-	-	1/1/1/1	-
3	EDO	A	615	-	-	0/1/1/1	-
3	EDO	A	604	-	-	0/1/1/1	-
3	EDO	A	603	-	-	0/1/1/1	-
3	EDO	A	601	-	-	1/1/1/1	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	602	UDP	O4'-C1'	3.43	1.49	1.42
5	B	602	UDP	C4-N3	-2.94	1.33	1.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	602	UDP	C2-N1	2.84	1.42	1.38
5	B	602	UDP	C2-N3	-2.32	1.33	1.38

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	602	UDP	C5-C4-N3	5.34	122.28	114.80
5	B	602	UDP	C4-N3-C2	-4.23	121.36	126.61
5	B	602	UDP	O2A-PA-O3A	4.09	118.33	107.27
5	B	602	UDP	O4-C4-C5	-3.56	119.02	125.16
5	B	602	UDP	N3-C2-N1	3.14	118.98	114.89
5	B	602	UDP	O4'-C4'-C3'	2.15	109.42	105.15
7	F	102	NGA	O5-C1-C2	-2.12	108.02	111.29

All (2) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
7	F	101	NGA	C1
7	F	102	NGA	C1

All (25) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	601	EDO	O1-C1-C2-O2
3	B	618	EDO	O1-C1-C2-O2
3	A	609	EDO	O1-C1-C2-O2
3	A	611	EDO	O1-C1-C2-O2
3	B	609	EDO	O1-C1-C2-O2
3	B	614	EDO	O1-C1-C2-O2
3	B	616	EDO	O1-C1-C2-O2
3	B	612	EDO	O1-C1-C2-O2
3	B	615	EDO	O1-C1-C2-O2
7	F	102	NGA	O5-C5-C6-O6
3	A	608	EDO	O1-C1-C2-O2
3	A	610	EDO	O1-C1-C2-O2
3	B	604	EDO	O1-C1-C2-O2
3	B	606	EDO	O1-C1-C2-O2
6	B	621	GOL	C1-C2-C3-O3
3	A	612	EDO	O1-C1-C2-O2
3	B	605	EDO	O1-C1-C2-O2
3	A	614	EDO	O1-C1-C2-O2
3	B	610	EDO	O1-C1-C2-O2

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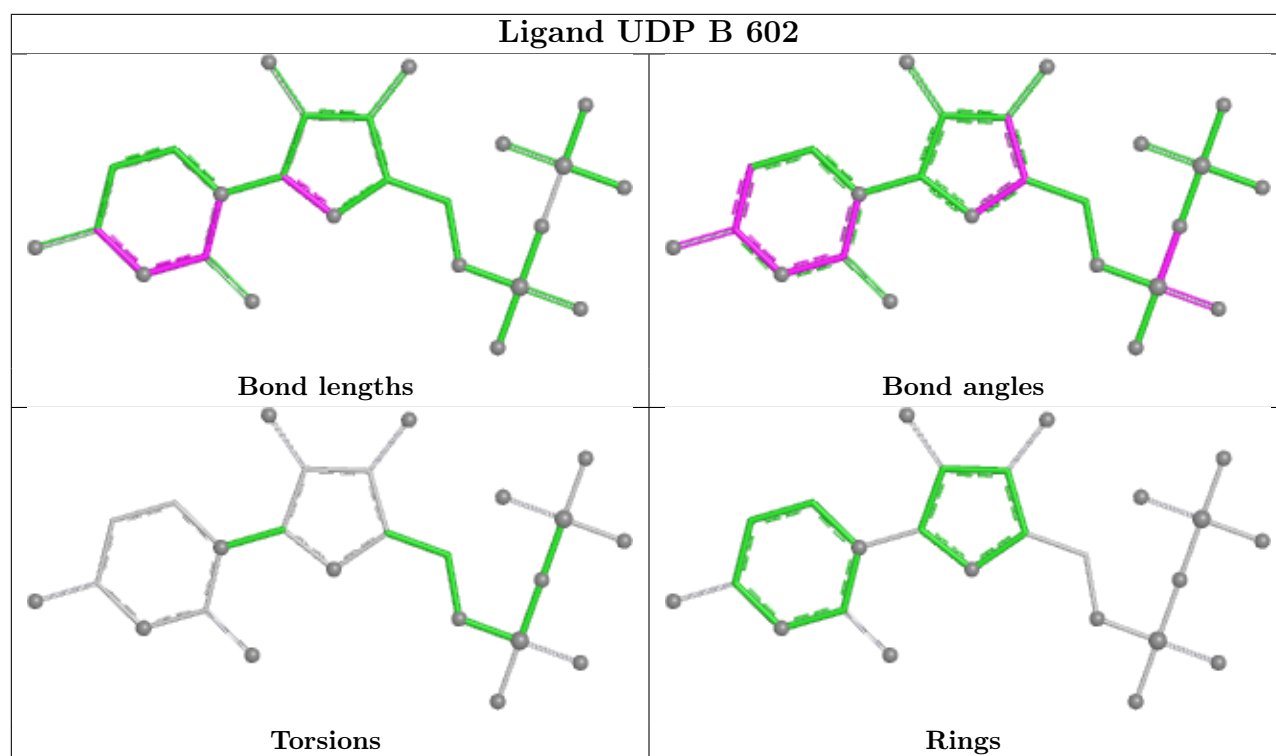
Mol	Chain	Res	Type	Atoms
3	B	611	EDO	O1-C1-C2-O2
3	B	619	EDO	O1-C1-C2-O2
3	A	607	EDO	O1-C1-C2-O2
3	A	613	EDO	O1-C1-C2-O2
3	B	617	EDO	O1-C1-C2-O2
3	A	617	EDO	O1-C1-C2-O2

There are no ring outliers.

8 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	607	EDO	2	0
7	F	102	NGA	1	0
3	A	612	EDO	2	0
3	A	611	EDO	1	0
3	B	620	EDO	3	0
3	A	618	EDO	2	0
3	A	608	EDO	2	0
3	A	613	EDO	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ > 2		OWAB(Å ²)	Q < 0.9
1	A	515/578 (89%)	0.21	35 (6%)	23 22	20, 46, 114, 151	8 (1%)
1	B	521/578 (90%)	0.15	11 (2%)	63 64	23, 46, 88, 122	6 (1%)
2	F	15/16 (93%)	0.70	1 (6%)	24 22	40, 48, 116, 126	0
All	All	1051/1172 (89%)	0.19	47 (4%)	38 37	20, 46, 105, 151	14 (1%)

All (47) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	448	ILE	3.7
1	A	554	PRO	3.6
1	A	558	PRO	3.6
1	A	472	LEU	3.5
1	A	548	LEU	3.4
1	A	549	SER	3.1
1	A	453	ILE	3.1
1	A	513	VAL	2.9
1	A	533	PHE	2.9
1	B	444	TRP	2.8
2	F	2	ALA	2.8
1	A	512	TYR	2.7
1	A	458	LEU	2.7
1	A	452	GLY	2.6
1	A	537	GLY	2.6
1	A	576	PHE	2.6
1	A	560	VAL	2.6
1	B	533	PHE	2.5
1	A	474	LEU	2.5
1	A	550	ALA	2.5
1	A	539	ILE	2.4
1	B	531	TRP	2.4
1	A	568	LEU	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	567	ALA	2.4
1	A	574	TRP	2.4
1	A	514	GLY	2.4
1	A	551	TYR	2.4
1	B	333	VAL	2.4
1	A	450	SER	2.4
1	B	564	THR	2.3
1	A	270	ILE	2.3
1	A	333	VAL	2.3
1	A	447	ALA	2.3
1	A	538	THR	2.3
1	A	573	ILE	2.3
1	A	477	CYS	2.3
1	A	565	CYS	2.2
1	B	450	SER	2.2
1	B	485	PHE	2.2
1	A	457	CYS	2.2
1	A	540	PHE	2.1
1	B	538	THR	2.1
1	A	562	MET	2.1
1	B	530	ILE	2.1
1	B	537	GLY	2.0
1	A	467	PRO	2.0
1	B	442	PRO	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

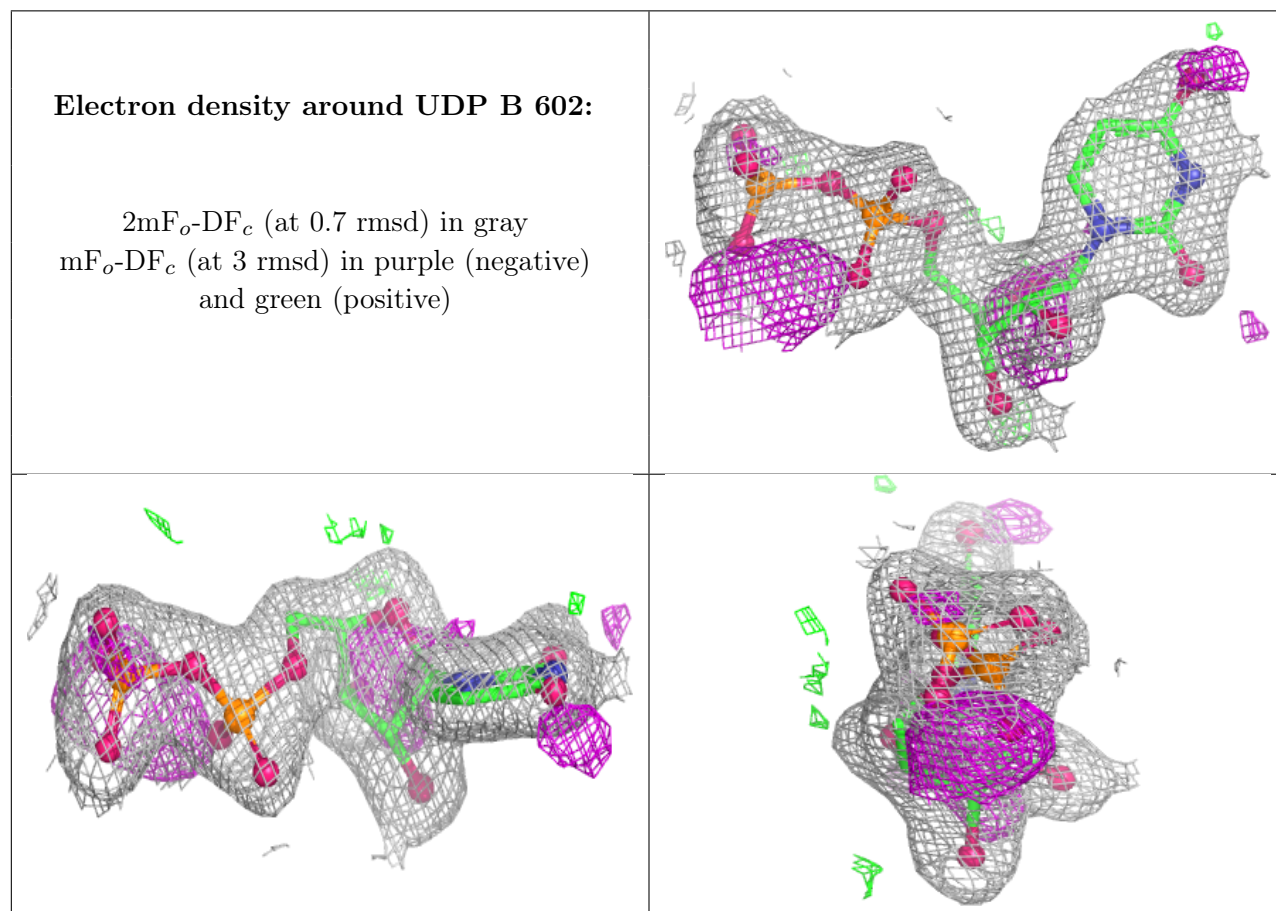
6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	EDO	A	616	4/4	0.61	0.14	76,77,80,83	0
3	EDO	B	618	4/4	0.61	0.12	81,88,89,92	0
3	EDO	B	614	4/4	0.69	0.18	80,86,91,94	0
3	EDO	B	609	4/4	0.74	0.15	70,72,77,78	0
3	EDO	A	610	4/4	0.76	0.19	63,66,74,77	0
3	EDO	A	618	4/4	0.77	0.29	20,20,20,20	0
3	EDO	B	617	4/4	0.79	0.16	68,90,91,92	0
3	EDO	B	619	4/4	0.80	0.14	67,69,70,75	0
6	GOL	B	621	6/6	0.81	0.12	65,79,81,88	0
3	EDO	A	601	4/4	0.82	0.15	39,41,43,59	0
3	EDO	B	607	4/4	0.82	0.13	61,63,64,66	0
3	EDO	B	611	4/4	0.83	0.15	66,70,74,78	0
3	EDO	B	610	4/4	0.83	0.17	89,98,104,104	0
3	EDO	B	620	4/4	0.85	0.43	20,20,20,20	0
3	EDO	B	604	4/4	0.85	0.12	86,86,88,89	0
3	EDO	A	615	4/4	0.86	0.14	71,73,77,80	0
3	EDO	A	611	4/4	0.86	0.14	58,59,65,66	0
3	EDO	A	608	4/4	0.87	0.09	69,72,75,79	0
3	EDO	A	609	4/4	0.87	0.10	65,73,76,80	0
3	EDO	A	605	4/4	0.87	0.10	76,77,81,84	0
3	EDO	A	614	4/4	0.88	0.11	80,80,85,93	0
3	EDO	B	606	4/4	0.88	0.12	60,64,66,70	0
3	EDO	B	608	4/4	0.89	0.12	60,62,71,71	0
3	EDO	B	613	4/4	0.90	0.11	62,63,64,70	0
3	EDO	A	606	4/4	0.90	0.12	50,56,63,66	0
3	EDO	B	616	4/4	0.90	0.12	73,78,79,82	0
3	EDO	A	604	4/4	0.90	0.15	44,53,56,59	0
3	EDO	A	607	4/4	0.92	0.11	62,62,62,73	0
3	EDO	B	615	4/4	0.92	0.09	62,67,69,76	0
3	EDO	B	612	4/4	0.92	0.08	31,35,39,49	0
3	EDO	A	612	4/4	0.92	0.10	38,44,46,52	0
7	NGA	F	102	14/15	0.92	0.08	65,70,77,77	0
3	EDO	B	605	4/4	0.93	0.10	51,65,67,72	0
7	NGA	F	101	14/15	0.93	0.07	44,52,63,64	0
3	EDO	A	613	4/4	0.93	0.11	60,62,67,74	0
3	EDO	A	617	4/4	0.95	0.08	62,68,69,73	0
3	EDO	A	602	4/4	0.95	0.07	37,39,40,42	0
3	EDO	A	603	4/4	0.96	0.07	43,47,53,54	0
3	EDO	B	603	4/4	0.96	0.06	37,38,38,40	0
5	UDP	B	602	25/25	0.97	0.06	34,37,40,42	0
4	MN	B	601	1/1	0.97	0.15	60,60,60,60	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers

as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.



6.5 Other polymers [i](#)

There are no such residues in this entry.